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Educational Metaverse as an Alternative Venue for School Events: Examining Digital Participation and Social Presence in a Virtual World

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Abstract:

School events are disrupted by natural disasters, health crises, or other unforeseen circumstances. When physical gatherings become impossible but cancellation is undesirable, institutions often shift events to virtual platforms. However, studies have identified limitations of virtual events, including reduced spontaneity, limited interpersonal interaction, and weaker feelings of presence and connection. Recent research suggests that virtual environments capable of simulating shared spaces may help overcome these limitations. This study investigates the metaverse as an alternative venue for school events. Guided by the Social Presence–Virtuality of Environment–Location Cube, Ecological Systems Theory, and the Metaverse Experience and Technology Acceptance model, a quasi-experimental design with constrained group-based allocation compared experiences across physical, videoconferencing, and metaverse-based events. Physical venues produced the highest ratings for environmental support and satisfaction. Nevertheless, metaverse-based events generated higher engagement than videoconferencing and were perceived as similarly engaging to students' prior in-person event experiences. Participants also reported stronger social presence in the metaverse than in videoconferencing environments, indicating that immersive virtual spaces better support shared experiences. Students preferred physical and metaverse formats over videoconferencing for school events. Overall, the findings suggest that the metaverse is a promising alternative for sustaining student interaction and engagement when physical venues are unavailable.

Keywords:

Metaverse, Videoconferencing, School Events, Experimental Research, Quasi-Experiment, Social Presence, Student Engagement



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INTRODUCTION

School events play a pivotal role in shaping the overall educational experience (Liu & Tan, 2019). These events encompass a wide range of curricular and extracurricular activities organized within educational institutions to engage students in experiences that extend beyond the traditional classroom setting. As integral components of school life, they provide key opportunities for social interaction, community building, and the cultivation of transferable soft skills that complement and reinforce academic learning. Events such as sports competitions, cultural programs, and academic fairs expose students to teamwork, leadership, and communication (O'Donnell et al., 2024; Seow & Pan, 2014). Participation in these activities consequently contributes to students' holistic development by fostering a sense of belonging, encouraging collaboration, and strengthening collective identity and school spirit. However, school events are occasionally disrupted or canceled due to unforeseen circumstances (e.g., natural disasters, public health crises, or logistical constraints). Such cancellations deprive students of meaningful opportunities for engagement, socialization, and informal learning that are often difficult to replicate in routine classroom contexts. Ensuring the continuity of school events is therefore essential for sustaining the social and emotional fabric of the school community and preserving the developmental benefits that these experiences uniquely provide.

The study begins with an acknowledgment that continuing school events during periods of disruption should never come at the expense of student safety or well-being. Exploring safe and feasible alternatives is consequently crucial when traditional in-person events are not possible. One exemplification is the transition to online venues during the COVID-19 pandemic, such as the virtual field trips conducted by Garcia et al. (2023b) as an alternative to their physical counterparts. In their study, they found that the virtual format allowed students to participate in extracurricular activities without the risks associated with in-person gatherings. Unfortunately, several studies have also identified drawbacks to transitioning events to virtual formats. Ton and Do (2022) underscored that the lack of interpersonal interaction negatively impacts attendee experiences. Standaert et al. (2021) noted that spontaneous social interactions, which are common in face-to-face settings, require a sense of co-location in technology-mediated events. Piccio et al. (2022) further observed that building a sense of presence and place is more challenging in online environments. A common theme across these studies is the reliance on internet-based videoconferencing, which underscores the need for further research into platforms that better promote interaction and a stronger sense of presence in virtual settings. The same studies recommend using virtual avatars and three-dimensional environments (Ton & Do, 2022), adopting new digital formats to bring attendees closer together (Piccio et al., 2022), and selecting platforms that better simulate a shared space or environment (Standaert et al., 2021).

Despite traditional distance education platforms being a viable alternative, it is evident they may not be sufficient to fully replicate the richness of in-person events. This recognition calls for exploring other virtual environments that can bridge the gap between physical and digital experiences. The recommendations provided in the literature align closely with the capabilities of

the metaverse, which allows for richer social interactions and a heightened sense of presence using digital avatars and shared virtual spaces (Oh et al., 2023; Pradana & Elisa, 2023). By enabling participants to move, interact, and communicate within a simulated environment, metaverse platforms may offer a more event-like experience than conventional videoconferencing tools, particularly for activities that depend on participation, spontaneity, and a sense of shared place. However, the utilization of the metaverse as a venue for school events is still in its early stages, with limited research available. The pioneering study on this topic primarily emphasized the positive aspects of the experience (Garcia et al., 2024), but more empirical research is needed, particularly studies that compare the metaverse with other event settings. Understanding the differences between various event settings is crucial for schools seeking to adapt to changing circumstances without compromising the quality of students' experiences.

As educational institutions increasingly explore alternative venues like videoconferencing and the metaverse, it becomes essential to compare these environments with traditional physical settings. Each setting offers unique opportunities and challenges in terms of engagement, interaction, and the overall student experience (Bietz et al., 2022; Garcia et al., 2024; Standaert et al., 2021). More specifically, the venues differ in the interactional affordances they make available. In physical events, turn-taking is often fluid and minimally regulated, peer-to-peer interaction can emerge spontaneously through copresence, and communication is shaped by shared physical context. In videoconferencing settings, interaction is typically more sequential and platform-mediated, with speaking opportunities often managed through host control, mute/unmute conventions, chat, or breakout rooms. By contrast, metaverse environments introduce avatar-based and spatially situated interaction, where movement, proximity, and co-location within a three-dimensional environment can influence visibility, conversational access, and the spontaneity of peer encounters. These differences are especially relevant for school events because such events rely not only on content delivery but also on informal communication, shared atmosphere, and socially situated participation. Thus, the objective of this study is to examine how school events held in the metaverse compare to those conducted in physical and traditional online settings. Specifically, it addresses the following research questions:

1. How do students' experiences of school events in videoconferencing and metaverse venues compare with their prior experiences of in-person school events?
2. How do students' experiences during school events differ across three venues: physical, videoconferencing, and metaverse?
3. How do videoconferencing and metaverse venues compare in terms of perceived ease of use, perceived usefulness, and social presence during virtual school events?
4. Is there a significant difference in students' post-event venue preferences across assigned venues (physical, videoconferencing, or metaverse)?
5. Is there a significant difference in students' willingness to attend future school events across event formats (physical, videoconferencing, or metaverse)?

BACKGROUND AND THEORETICAL FRAMEWORKS

Typology of Physical and Virtual Events

To understand the diverse nature of physical and virtual events, this study refers to the Social Presence-Virtuality of Environment-Location (SPEL) Cube as a conceptual framework for classifying events (Yung et al., 2022). The SPEL Cube integrates three dimensions (i.e., social presence, virtuality of the environment, and location) to offer a comprehensive typology. For example, traditional in-person events typically score high on all dimensions. They have high social presence due to the physical co-location of participants, occur in fully real environments, and are based in fixed physical locations (e.g., graduation ceremonies, conferences, and sporting events). On the other hand, online events conducted via videoconferencing platforms like Google Meet, Zoom, or Microsoft Teams tend to score low in social presence due to dispersed participants and limited interaction, and they occur in low-virtuality environments with basic digital interfaces (e.g., webinars or virtual meetings). In contrast, metaverse-based events present an interesting mix. While participants are in separate physical locations (low physical co-location), the highly immersive 3D environment offers the potential for high social presence. Virtual worlds simulate the feeling of being in the same space through avatars and interactive environments. The virtuality of the environment is also high in these settings, offering an experience that can closely mimic or even surpass the interactivity of real-world environments. Overall, this spectrum highlights the importance of understanding how these dimensions influence participant experience across different event formats. The significant differences between these venues in various dimensions justify the need to compare them. In the present study, the SPEL Cube primarily serves as the venue-typology lens for explaining what structurally differs across the three event conditions (e.g., the degree of copresence, virtuality, and interactional openness) rather than to explain students' evaluative responses to the event itself.

Metaverse Experience and Technology Acceptance Model

The Metaverse Experience and Technology Acceptance (META) model provides an integrated lens for understanding how users evaluate and adopt metaverse-based environments by jointly accounting the functional determinants of technology adoption and the experiential dynamics of embodied social participation (Garcia, 2025). Rather than treating metaverse participation as a purely usability-driven decision, META conceptualizes adoption and sustained engagement as shaped by the interaction of (a) technology acceptance factors (e.g., perceived usefulness and perceived ease of use) and (b) metaverse-specific experiential determinants (e.g., including immersion and social presence). These acceptance factors remain central to the model's explanatory power and draw from established acceptance research (e.g., Davis, 1989), while the experiential determinants reflect how metaverse environments allow users to feel embodied, socially connected, and meaningfully “present” through avatar-mediated interaction and spatial engagement (Mennecke et al., 2010). This integrated emphasis is especially

appropriate for school events, where participation is not only instrumental but also community-oriented. Event success depends not only on usability and perceived benefit but also on the extent to which the platform enables communal energy, interpersonal spontaneity, and a shared sense of place. These experiential qualities are often difficult to support in conventional videoconferencing settings (Bietz et al., 2022). Accordingly, META serves as the user-perception and acceptance lens, particularly for interpreting perceived ease of use, perceived usefulness, social presence, and downstream preference-related outcomes in the virtual conditions.

Ecological Systems Theory

The Ecological Systems Theory (EST) is a useful theoretical lens for understanding the complex interplay of environments that shape school events. Originally introduced by Bronfenbrenner (1992), this theory suggests that human development is shaped by interactions within five interconnected systems: the microsystem, mesosystem, exosystem, macrosystem, and chronosystem. Each of these systems represents a distinct context that influences an individual's growth. While all subsystems contribute to development, the microsystem (i.e., being the most immediate environment) has a particularly direct influence (El Zaatari & Maalouf, 2022). The microsystem includes direct interactions with family, friends, and those that occur within the school setting. Within the context of this study, EST emphasizes how school events are embedded in students' microsystems, where interactions with peers foster a sense of community, belonging, and emotional growth. Furthermore, the success and quality of these interactions often depend on the environmental support provided by the various ecological systems (Guo & Lee, 2023). Factors such as how well the event is organized, the availability of guidance and resources, and the creation of a safe and comfortable environment for expression can contribute to the success of student engagement (Garcia et al., 2024). Hence, the quality of the environment can influence the degree to which students feel empowered to express themselves and collaborate with others. In this study, EST functions as the broader ecological lens by situating experiences within the developmental role of the school-based microsystem, particularly in relation to environmental support, belonging, and the continuity of school community under disrupted conditions.

Integrative Theoretical Positioning

This study uses SPEL, META, and EST in combination because each framework addresses a different part of the problem and none of them is sufficient on its own. The SPEL Cube is used to explain what differs across the three venues at the level of event structure. It helps distinguish physical, videoconferencing, and metaverse settings in terms of social presence potential, virtuality of environment, and location. These distinctions are important for identifying how each venue affords or constrains interaction, but they do not explain how students interpret those conditions. The META framework addresses that next level by focusing on how students evaluate and respond to technology-mediated environments, especially in terms of perceived ease of use, perceived usefulness, social presence, and preference-related outcomes. This is particularly relevant in the virtual conditions, where the experience of the activity venue depends

on what the platform can do and how participants perceive its usability and social quality. EST then places these experiences within the wider context of school life. Because school events are part of the school microsystem, differences in support, belonging, interaction, and participation carry developmental and community-related significance. This combination gives the study a clearer basis for examining school events as more than delivery formats. Physical, videoconferencing, and metaverse events differ not only in technical form, but also in how those forms are experienced by students and in what those experiences mean within school life. Using the three frameworks together makes it possible to interpret venue differences at the level of design, perception, and educational significance. This integrative positioning helps explain whether one venue is rated more favorably than another and why those differences matter for interaction, support, and community in disrupted or alternative event settings.

METHODOLOGY

Research Design

This study employed a three-condition quasi-experimental comparative research design to examine student responses to three event venues: (1) a physical on-campus venue, (2) a videoconferencing platform, and (3) a metaverse environment. The study was implemented using intact class sections rather than fully individualized assignment at the point of intervention. Accordingly, the design is best characterized as quasi-experimental with constrained group-based allocation. Due to institutional and logistical constraints (e.g., availability of venue access, class scheduling, and the need to administer the intervention to intact student groups), full individual random assignment was not feasible. Instead, comparable student sections were selected and each section was assigned to one of the three event conditions under a constrained allocation process designed to preserve implementation feasibility while reducing obvious imbalance across conditions. Following allocation, participants completed a pretest (baseline experiences and expectations) prior to attending the assigned event format, and a posttest immediately after participation to enable within-group (pre–post) and between-group comparisons.

To isolate the “venue mode” as the primary differentiator, the three event formats were structured to follow a comparable program flow (orientation → activity participation → closing), while allowing venue-specific affordances to operate naturally (see **Error! Reference source not found.**). The constrained allocation was necessary for three reasons: event delivery had to align with existing class schedules and institutional coordination requirements, each venue condition required different technical and organizational arrangements that made simultaneous individualized assignment impractical, and keeping students within intact sections reduced implementation disruption while maintaining consistent facilitation during the event. Because allocation occurred under real-world institutional constraints, the design does not provide the same level of control as a fully randomized experiment. However, internal validity was strengthened by holding the event theme and program structure constant across conditions, administering common instruments, and examining baseline comparability on students’ prior in-

person event experience. These steps do not eliminate all threats to internal validity, but they reduce the likelihood that observed differences can be attributed solely to obvious pre-existing group differences.

Setting and Context

This study was conducted at a renowned institute of technology located in the largest metropolitan area of the Philippines. The institution was chosen for its reputation as a forward-thinking educational hub that has pioneered the use of advanced technologies in academic settings. Notably, the institute has developed and implemented the first-ever educational metaverse platform designed specifically for providing an immersive and interactive virtual experience for students. MILES Virtual World is a comprehensive virtual environment that mirrors the physical world by accurately replicating the institution's campuses (Garcia et al., 2023a). It is a mirror-world type of metaverse that operates on computers and mobile phones without requiring virtual reality headsets. The platform includes virtual representations of key facilities such as classrooms, libraries, administrative offices, and event spaces, allowing teachers and students to navigate and interact within a simulated version of the campuses. MILES Virtual World enables users to carry out a variety of activities that are typically conducted in the physical world, including attending events, interacting with peers and faculty, and participating in simulations that mimic real-life scenarios (e.g., Garcia, 2026). While conducting school events in physical and videoconferencing environments is relatively straightforward, developing such a fully immersive metaverse platform is a more complex and time-intensive process. Therefore, the decision to focus on this institution and its metaverse platform was a logical choice for this study.



Figure 1. Marriage Booth in the Metaverse During the Valentine's Day School Event Celebration

Procedures and Data Collection

The experiment was conducted in February 2024 during the Valentine's season. MILES Virtual World was redesigned to host a variety of Valentine-themed activities (Garcia et al., 2024). One of the highlights of the event was the marriage booth (Figure 1), where students could symbolically marry each other in a playful activity that encouraged social interaction and engagement. Before data collection, students were informed about the purpose of the study, the voluntary nature of their participation, and their right to decline participation in any specific activity or withdraw from the study without penalty. Participation in this activity was voluntary, and students were free to decline or opt out without penalty. The activity was presented as a lighthearted and symbolic Valentine-themed event feature rather than a required or personally binding interaction. Students who preferred not to participate in the marriage booth could still take part in the broader event through other available activities. Students who opted out were not required to explain their decision and were allowed to engage in other event features, such as the photo booth or general peer interaction, so that non-participation did not result in exclusion from the event experience. To reduce potential discomfort, facilitation emphasized respectful participation and allowed students to choose their level of involvement. Other features, such as the virtual photo booth (Figure 2), were also available to further enrich the virtual experience.



Figure 2. Photo Booth in the Metaverse Featuring an Exact Digital Replica of the Campus Plaza

For the physical event, the booths were set up in the same central location on campus as in the metaverse, where students could participate in person, interact directly with peers, and take part in the various activities. On the other hand, the videoconferencing event used Microsoft Teams, where students participated via a digital marriage booth facilitated by a moderator. Students interacted in breakout rooms to simulate the smaller group interactions that are typical in physical events. In the metaverse event, the booth was recreated within MILES Virtual World at the same location as the physical event, where students, using their avatars, could approach the booth, symbolically interact with each other, and engage in activities through avatar-based

gestures and spatial interactions. Although facilitation was adapted to the affordances of each environment, it was kept consistent in overall intent and sequence across conditions. All three event formats followed the same general program flow (orientation, activity participation, and closing), and each condition included active facilitator support to guide participation, provide instructions, and maintain the intended tone of the event.

Using a simple random sampling method, three sections of 40 students each were selected. These sections served as the operational units for event implementation. Because the intervention had to be delivered within intact class and scheduling structures, the three selected sections were assigned by section to one of the three experimental conditions: physical, videoconferencing, or metaverse. Thus, while random procedures were used in section selection, the actual intervention was implemented through constrained group-based assignment rather than unrestricted individual-level randomization. Prior to participation in the event, all students were administered a pretest (see **Error! Reference source not found.**) to capture baseline measures of their prior experience with a similar in-person school event. The pretest consisted of demographic information and questions measuring their perceptions related to engagement, sense of community, perceived value, environmental support, and satisfaction. After the event, all students were given a post-test (see **Error! Reference source not found.**), which included the same constructs measured in the pretest, with additional questions assessing social presence, perceived ease of use, and perceived usefulness for the metaverse and videoconferencing groups. The post-test also included items about students' venue preference and their willingness to attend future events in the same format or alternative formats.

Instrument and Data Analysis

The survey instrument used in this study was developed based on EST, META, and the SPEL Cube as the core theoretical foundations. Item development followed a theory-driven approach, with each construct operationalized according to its conceptual definition within the study's theoretical framework. To strengthen conceptual alignment, items were informed by prior studies on metaverse and virtual environment evaluation while being adapted to the specific context of school events (e.g., Garcia et al., 2023a; Oh et al., 2023). The perceived ease of use, perceived usefulness, and social presence items were aligned with the META model, which integrates key constructs from the Technology Acceptance Model (Davis, 1989) and Embodied Social Presence Theory (Mennecke et al., 2010) to explain user experience and acceptance in metaverse environments. The remaining event-experience constructs (engagement, sense of community, perceived value, environmental support, and satisfaction) were developed to align with the study's theoretical framing and event context. Before full implementation, the instrument was pilot tested with a smaller group of students ($n = 20$) to assess item clarity, response consistency, and overall suitability for the study context. Reliability analysis was conducted using Cronbach's alpha (α), and the pilot results indicated acceptable to strong internal consistency across the multi-item constructs: engagement ($\alpha = .84$), sense of community ($\alpha = .88$), perceived

value ($\alpha = .82$), environmental support ($\alpha = .86$), satisfaction ($\alpha = .85$), perceived ease of use ($\alpha = .89$), perceived usefulness ($\alpha = .87$), and social presence ($\alpha = .90$).

The data collected from the pretest and post-test were analyzed using a combination of descriptive and inferential statistical methods. Descriptive statistics (such as means and standard deviations) were calculated to summarize students' experiences in each of the three event settings. Non-parametric tests were employed due to the ordinal nature of the Likert scale data and the presence of some non-normal distributions. The Wilcoxon signed-rank test was used to assess within-group differences, comparing students' experiences in the metaverse and videoconferencing settings to their prior in-person experiences (RQ1). For between-group comparisons, the Kruskal-Wallis test was used to evaluate differences in student experiences across all three event formats (RQ2) while Mann-Whitney U test was used to compare students' perceived ease of use, perceived usefulness, and social presence between the videoconferencing and metaverse settings (RQ3). Lastly, chi-square tests of independence were applied to determine whether students' venue preference differed across assigned settings (RQ4), while Cochran's Q test was used to determine whether students' willingness to attend future school events differed across event formats within each group (RQ5). The preference and willingness items were intentionally measured using dichotomous (yes/no) responses because they were designed to capture clear post-event choice outcomes appropriate for categorical group comparisons. While this format supports direct interpretation of participation intentions, future research may use Likert-type response scales to capture greater attitudinal nuance.

RESULTS

A total of 120 students enrolled in computing-related programs participated in the study. The sample consisted predominantly of male students, with a mean age of 21.55 years ($SD = 1.42$). On average, students frequently attended in-person (3.47 ± 0.59) and videoconferencing (3.04 ± 0.87) school events in the last school year, while attendance in the metaverse was rare (1.47 ± 0.51). This result is unsurprising, as limited school events have been conducted in the metaverse format thus far. In terms of their prior experience with in-person school events, the Kruskal-Wallis test showed no significant differences among the groups in ratings engagement ($\chi^2 = .053, p = .974$), sense of community ($\chi^2 = 4.512, p = .105$), perceived value ($\chi^2 = 1.552, p = .460$), environmental support ($\chi^2 = 6.672, p = .066$), and satisfaction ($\chi^2 = .430, p = .807$). These findings suggest that baseline experiences with in-person events were similar across all groups.

RQ1: How do students' experiences of school events in videoconferencing and metaverse venues compare with their prior experiences of in-person school events?

Mixed findings were observed when comparing students' perceived experiences in the videoconferencing and metaverse settings with their prior in-person experiences (Table 1). For the metaverse group, students reported significantly higher engagement in the metaverse compared to their physical experience ($Z = -2.43, p = .015, r = .38$). Conversely, environmental

support was rated higher in the physical setting than in the metaverse ($Z = -2.48, p = .013, r = .39$). These results indicate that while students in the metaverse group experienced the metaverse setting as more engaging relative to their recalled in-person benchmark, they perceived greater environmental support during in-person events. Other constructs showed no significant differences: sense of community ($Z = -1.70, p = .089, r = .27$), perceived value ($Z = -0.65, p = .519, r = .10$), and satisfaction ($Z = -0.35, p = .727, r = .06$). The lack of significant differences suggests that students' experiences in these areas were comparable across the metaverse and physical settings at the level of self-reported comparison.

Table 1. Comparative Analysis of Event Experiences Between Physical and Alternative Event Formats

Event Experience Dimensions	Metaverse Group (Pre-Post)			Videoconferencing Group (Pre-Post)		
	Physical Event	Metaverse Event	<i>p</i> -value	Physical Event	Videoconferencing Event	<i>p</i> -value
Engagement	3.85 ± 1.33	4.35 ± 0.77	.015	3.83 ± 1.55	3.33 ± 1.56	.171
Sense of Community	3.93 ± 1.07	3.40 ± 1.55	.089	3.28 ± 1.65	3.10 ± 1.71	.640
Perceived Value	4.05 ± 1.55	3.85 ± 1.53	.519	3.68 ± 1.66	2.80 ± 1.73	.023
Environmental Support	4.23 ± 1.12	3.55 ± 1.36	.013	3.75 ± 1.68	2.90 ± 1.52	.019
Satisfaction	4.13 ± 0.99	4.00 ± 1.32	.727	4.03 ± 1.07	3.28 ± 1.75	.040

For the videoconferencing group, the comparison between videoconferencing and prior in-person event experiences showed a more consistent pattern, with prior physical events rated significantly higher across several dimensions. Specifically, students rated perceived value higher for prior physical events ($Z = -2.270, p = .023, r = .36$), reflecting the greater meaningfulness and relevance they associated with those experiences. Environmental support, referring to the resources and guidance provided during the event, was also rated significantly higher for prior physical events than for videoconferencing events ($Z = -2.351, p = .019, r = .37$). Satisfaction was likewise higher for prior physical events than for videoconferencing events ($Z = -2.053, p = .040, r = .32$), indicating that students found in-person experiences more fulfilling overall. No significant differences were observed for engagement ($Z = -1.371, p = .171, r = .22$) or sense of community ($Z = -.468, p = .640, r = .07$), suggesting that students felt similarly engaged and connected to peers in both videoconferencing and prior in-person settings.

RQ2: How do students' experiences during school events differ across three venues: physical, videoconferencing, and metaverse?

Students' experiences during school events varied across the physical, videoconferencing, and metaverse settings in terms of engagement, perceived value, and environmental support (Table 2). For engagement, the Kruskal-Wallis test showed a significant difference ($\epsilon^2 = .05, p = .016$), with Mann-Whitney *U* test revealing that the metaverse offered significantly higher engagement than the videoconferencing format ($U = 518.5, Z = -2.853, p = .004, r = .32$).

Perceived value also varied significantly across settings ($\epsilon^2 = .04$, $p = .037$), with the metaverse rated significantly higher than the videoconferencing setting ($U = 543.0$, $Z = -2.611$, $p = .009$, $r = .29$). For environmental support, significant differences were found ($\epsilon^2 = .07$, $p = .008$), with both physical ($U = 495.0$, $Z = -3.045$, $p = .002$, $r = .34$) and metaverse ($U = 599.5$, $Z = -1.979$, $p = .048$, $r = .22$) scoring significantly higher than videoconferencing events. By contrast, no significant differences were found between physical and metaverse settings on any of the event experience dimensions, suggesting that students' experiences in these two formats were generally comparable across engagement, perceived value, and environmental support. Overall, these results indicate that physical and metaverse settings were more supportive of engagement and event value than videoconferencing, while also showing distinct venue-specific strengths.

Table 2. Comparison of Event Experience Across Physical, Metaverse, and Videoconferencing Settings

Experience Dimensions	Physical Group	Metaverse Group	Videoconferencing Group	<i>p</i> -value
Engagement	3.58 ± 1.47	4.35 ± 0.77	3.33 ± 1.56	.016
Sense of Community	3.75 ± 1.28	3.40 ± 1.55	3.10 ± 1.71	.173
Perceived Value	3.30 ± 1.79	3.85 ± 1.53	2.80 ± 1.73	.037
Environmental Support	3.90 ± 1.30	3.55 ± 1.36	2.90 ± 1.52	.008
Satisfaction	3.68 ± 1.76	4.00 ± 1.32	3.28 ± 1.75	.206

RQ3: How do videoconferencing and metaverse venues compare in terms of perceived ease of use, perceived usefulness, and social presence during virtual school events?

The Mann-Whitney U test results comparing videoconferencing and metaverse settings in terms of technology and social experience showed both significant and non-significant differences (Table 3). A significant difference was found in perceived ease of use, with the videoconferencing group scoring higher than the metaverse group ($U = 479.00$, $Z = -3.259$, $p = .001$, $r = .36$). Social presence also differed significantly, with the metaverse group scoring higher than the videoconferencing group ($U = 592.00$, $Z = -2.175$, $p = .030$, $r = .24$). No significant difference was found in perceived usefulness between the two groups ($U = 791.50$, $Z = -0.085$, $p = .932$, $r = .01$). These results indicate that although students found videoconferencing platforms easier to use, they experienced a stronger sense of social presence in the metaverse, while perceiving both technologies as similarly useful for virtual school event participation.

Table 3. Comparison of Technology Experience Between Metaverse and Videoconferencing Settings

Experience Dimensions	Metaverse	Videoconferencing	U	Z	<i>p</i> -value
Perceived Ease of Use	3.40 ± 1.37	4.33 ± 0.98	479.00	-3.259	.001
Perceived Usefulness	3.23 ± 1.75	3.35 ± 1.63	791.50	-.085	.932
Social Presence	4.28 ± 1.09	3.40 ± 1.74	592.00	-2.175	.030

RQ4: Is there a significant difference in students' post-event venue preferences across assigned venues (physical, videoconferencing, or metaverse)?

The results of the chi-square tests of independence indicate significant differences across settings for both preference indicators (Table 4). For future event participation in the same format, the proportion of students who preferred attending future events in the same format was highest in the physical group (34 students, 85%), followed by the metaverse group (29 students, 72.5%), and lowest in the videoconferencing group (16 students, 40%). The association between assigned venue and preference for future participation in the same format was statistically significant, $\chi^2(2) = 17.95$, $p < .001$, Cramér's $V = .39$. For venue preference, most students preferred their assigned venue over other formats, with the highest endorsement in the physical group (38 students, 95%), followed by the metaverse group (36 students, 90%), and the videoconferencing group (29 students, 72.5%). This association was also statistically significant, $\chi^2(2) = 9.92$, $p = .007$, Cramér's $V = .29$. These findings suggest that students' preferences for event formats vary depending on the setting they experienced, with physical and metaverse settings demonstrating stronger preference outcomes compared to videoconferencing.

Table 4. Preferences for Event Participation and Venue Format Across Various Settings

Preferences	Format	No	Yes	χ^2	p -value	Cramér's V
Participate in Future Events in Same Format	Physical	6	34	17.95	< .001	.39
	Metaverse	11	29			
	Videoconferencing	24	16			
Prefer Assigned Venue Over Other Formats	Physical	2	38	9.92	.007	.29
	Metaverse	4	36			
	Videoconferencing	11	29			

RQ5: Is there a significant difference in students' willingness to attend future school events across event formats (physical, videoconferencing, or metaverse)?

The analysis of students' willingness to attend future school events revealed significant differences across event formats within each student group (Table 5). In the physical group, willingness was highest for physical and metaverse events (both 36 students, 90%) and lowest for videoconferencing events (22 students, 55%), with a significant difference across formats ($Q = 15.077$, $p = .001$, Kendall's $W = .19$). A similar pattern was observed in the metaverse group ($Q = 37.310$, $p < .001$, Kendall's $W = .47$), where students reported the greatest willingness to attend metaverse events (38 students, 95%), followed by physical events (34 students, 85%), and substantially lower willingness for videoconferencing events (13 students, 32.5%). In the videoconferencing group, willingness remained higher for physical (34 students, 85%) and metaverse formats (32 students, 80%) than for videoconferencing (14 students, 35%), with differences again reaching statistical significance ($Q = 26.963$, $p < .001$, Kendall's $W = .34$).

Overall, these results indicate that students' willingness to attend future events consistently favored physical and metaverse formats over videoconferencing.

Table 5. Differences in Willingness to Attend Future School Events Based on Event Format

Student Group	Format	No	Yes	Cochran's Q	<i>p</i> -value
Physical	Physical	4	36	15.077	.001
	Metaverse	4	36		
	Videoconferencing	18	22		
Metaverse	Physical	6	34	37.310	< .001
	Metaverse	2	38		
	Videoconferencing	27	13		
Videoconferencing	Physical	6	34	26.963	< .001
	Metaverse	8	32		
	Videoconferencing	26	14		

DISCUSSION

School event disruptions due to unforeseen circumstances necessitate alternative delivery venues that preserve not only attendance but also the social and developmental functions of school celebrations. Prior work has repeatedly cautioned that merely migrating event programs to videoconferencing can constrain interpersonal spontaneity, shared atmosphere, and the experiential rituals that give school events their communal meaning (Piccio et al., 2022; Standaert et al., 2021; Ton & Do, 2022). Building on the SPEL Cube's typology of virtual event forms (Yung et al., 2022), this study compared physical, videoconferencing, and metaverse venues using EST (Bronfenbrenner, 1992) and the META model (Garcia, 2025) as integrative interpretive lenses. Across analyses, the results converge on a consistent pattern in which videoconferencing functions as an access-enabling venue but an experientially constrained celebration format, whereas metaverse environments more closely approximate several core experiential qualities of physical events by restoring socially situated and embodied participation, despite some infrastructural and usability frictions. Importantly, these experiential differences were reflected in post-event behavioral intentions, as students expressed weaker preferences and lower willingness to attend future events in videoconferencing compared to physical and metaverse formats.

Venue-Specific Shifts in Student Event Experience

Within-group comparisons suggest that shifting school events to videoconferencing came with meaningful experiential trade-offs, as students rated their prior in-person experiences

significantly higher in perceived value, environmental support, and satisfaction. These declines align with event research showing that online event migration can weaken the affective and ritualistic components of participation even when the program content is preserved (Piccio et al., 2022), and with meeting research emphasizing that synchronous platform-based interaction often lacks the mode capabilities needed for complex social objectives (Standaert et al., 2021). Importantly, this finding does not imply that videoconferencing is unusable for school events. Rather, it points to a venue–goal mismatch, where the platform supports attendance but fails to reproduce celebration dynamics. Similar limitations have been observed in virtual science festival, where maintaining access did not fully prevent reductions in engagement-related outcomes (Balestri et al., 2022). Vandenberg and Berghman (2024) corroborate this interpretation by showing that when collective events move online, participants often rely on hyper-ritualized symbolic interaction to compensate for the loss of shared physical context. This pattern should nonetheless be interpreted with some caution, since the physical benchmark was based on students’ recollections of prior in-person events rather than a concurrently observed comparison under matched conditions. As a result, the observed differences likely reflect comparative perceptions of venue experience, while also remaining susceptible to recall bias, memory selectivity, and retrospective preference for familiar in-person events.

From an EST perspective, the consistent advantage of physical events can be explained by the strength of the microsystem in face-to-face settings, where resources, guidance, and social interaction are immediate and more seamlessly integrated (Hayes et al., 2017). Physical venues support “proximal processes,” or frequent and direct interactions that reinforce belongingness and perceived support (El Zaatari & Maalouf, 2022). In contrast, videoconferencing environments may weaken these processes because support mechanisms and participation cues are mediated through screen-based interfaces, and students may feel less able to access assistance, social feedback, or facilitation in real time unless intentionally designed into the platform experience (Piccio et al., 2022). Interestingly, no significant differences were found for engagement or sense of community in videoconferencing versus physical events. This result suggests that students can remain involved and socially connected even in online settings, particularly when existing peer relationships and structured activities (e.g., breakout-room interactions or guided facilitation) are present. However, the results also imply that sustained engagement alone may not be enough to produce high satisfaction when environmental support and perceived value are diminished.

In contrast, the metaverse findings point to a more complex pattern than a straightforward replacement of in-person events. Students perceived the metaverse format as significantly more engaging than their prior physical experiences, even though physical events still offered stronger environmental support. This pattern suggests that immersive features can amplify attentional involvement and enjoyment, even when organizational support feels less stable than in physical venues. The observed moderate effect sizes also suggest that these were not only statistically detectable differences but were of practical educational relevance in students’ perceived event experiences. Prior work on immersive environments similarly emphasizes that immersive virtual environments can strengthen involvement by enabling activity-based participation, exploration,

and embodied interaction through avatars (Barreda-Ángeles et al., 2023; Martí-Testón et al., 2023). The lack of significant differences in perceived value and satisfaction suggests that metaverse events can approximate core experiential quality, while the near-significant shift in sense of community implies that social connectedness may be more sensitive to specific design and facilitation choices. Supporting this view, Oh et al. (2023) found that stronger social presence in metaverse platforms predicted more supportive interaction among young users, indicating that immersive social features can foster meaningful relational benefits rather than simply generating novelty-driven excitement. Even so, this result should be interpreted with caution because the comparison relies on students' recalled prior physical experiences rather than a concurrently observed in-person event. Accordingly, the higher engagement ratings should not be taken as evidence that metaverse events universally outperform physical events, but rather that, for this sample and context, the metaverse format was experienced as especially involving relative to students' remembered baseline of comparable school events.

Metaverse as an Experiential Alternative to Videoconferencing

The between-group comparisons further underscore that not all virtual venues provide comparable school event experiences. Videoconferencing consistently scored lowest across significant dimensions, whereas the metaverse more closely approximated patterns observed in physical events. Under the SPEL Cube (Yung et al., 2022), this difference becomes theoretically meaningful rather than purely technological. Videoconferencing represents a low-virtuality, low-co-location configuration that often constrains social presence, whereas the metaverse increases virtuality of environment and supports copresence through shared spatial cues and avatar embodiment. Thus, the venue difference should not be framed as "better technology" but as different event ecologies, where the metaverse, by virtue of its virtual-world environment, more closely approximates the affordances of physical celebrations for informal social participation.

Students in the metaverse condition reported significantly higher engagement and perceived value than students in the videoconferencing condition. This finding suggests that students perceived the metaverse events as more involving and meaningful within the context of the present study. The accompanying small-to-moderate effect sizes suggest that these differences are meaningful in practice, particularly given that engagement and perceived value are central objectives of school events rather than merely desirable secondary outcomes. It is also consistent with the argument that immersive virtual environments may help preserve key experiential qualities of physical events, particularly when they allow active exploration, spontaneous interaction, and activity-based participation rather than linear attendance. The advantage of a more immersive environment over videoconferencing, as well as its comparability to physical settings, is supported by Barreda-Ángeles et al. (2023), although the divergence from Di Natale et al. (2024), who reported no significant difference in social presence between videoconferencing and desktop-based virtual reality, suggests that outcomes may depend on context and design.

Supporting this interpretation, metaverse literature emphasizes that movement through 3D spaces and activity-based participation can enrich events by allowing users to explore, shift

between areas, and interact more informally (Martí-Testón et al., 2023). In school celebrations, such affordances may have contributed to students' perceptions of greater experiential depth by making the environment feel more socially and interactively supportive. An applied illustration is provided by Garcia et al. (2024), who hosted a holiday-themed school event in the metaverse with interactive activities that supported informal socialization and replicated aspects of an in-person celebration. In this sense, the study's claims concern the perceived conditions for interaction rather than interactional behavior in the discourse-analytic sense. The findings therefore support the argument that the metaverse was experienced as more interactionally supportive than videoconferencing, while leaving open the need for future work that examines actual communication practices within such environments.

One particularly notable outcome is the metaverse's advantage in fostering higher engagement than videoconferencing, while also showing engagement levels that were comparable to, and in the within-group comparison reported as higher than, students' recalled prior physical event experiences. This finding suggests that immersive environments may not merely replicate event attention but may amplify it by producing heightened focus and involvement. As argued by Rzeszewski et al. (2024), immersion can facilitate a psychologically concentrated attentional state, which aligns with situational models of engagement. Similarly, the META model proposes that engagement is strengthened when metaverse environments combine usability with experiential affordances that support embodiment, social connection, and meaningful presence (Garcia, 2025). In this setting, avatar-mediated interaction may have enhanced students' perceptions of copresence and social visibility, allowing participants to feel socially "seen" and connected in ways that go beyond screen-based interaction (Zhang et al., 2022). Moreover, hedonic motivation (enjoyment derived from the experience itself) may further sustain engagement and contribute to more favorable event evaluations (Jo & Shin, 2024; Lee et al., 2023). Collectively, these mechanisms provide plausible explanations for why the metaverse was perceived as a uniquely engaging online venue compared to more linear and passive videoconferencing platforms.

In addition to engagement and perceived value, the results highlight environmental support as a key dimension in differentiating venue effectiveness. Both physical and metaverse events were rated significantly higher in environmental support than videoconferencing, suggesting that videoconferencing formats may be particularly limited in providing students with the resources, guidance, and facilitative cues typically embedded in event participation. This strengthens the argument that videoconferencing platforms may function adequately for formal communication and linear delivery of content but may not sufficiently reproduce the supportive conditions required for complex school events where participants benefit from interactive guidance, immediate feedback, and a structured experience environment. In contrast, immersive environments may better approximate physical event conditions by embedding navigational structure and enabling richer interaction cues that support participation and access to help. Importantly, the absence of significant differences between physical and metaverse settings across the measured experience dimensions suggests that metaverse events were perceived to approximate many of the experiential characteristics of in-person events, whereas

videoconferencing environments remain comparatively constrained. At the same time, no significant differences were found between the three venues in sense of community and satisfaction, implying that students may still experience a general level of connectedness and event approval regardless of venue, but that venue affordances are more likely to shape engagement-related and support-related experiences.

Usability and Social Presence Tradeoffs Between Virtual Venues

In terms of the technological and social dimensions of online event venues, the findings reveal a usability–presence tradeoff between videoconferencing and metaverse venues. Videoconferencing platforms were rated significantly higher in perceived ease of use, suggesting that students found these tools more straightforward and less cognitively demanding to navigate. This is consistent with the reality that videoconferencing has become a highly familiar “default” mode for school participation, particularly after the widespread transition to emergency remote education during the COVID-19 pandemic. As a result, students may have developed strong procedural comfort with basic platform functions (e.g., joining sessions, using chat, switching audio/video), which reduces friction during event participation. In the context of technology acceptance, this ease-of-use advantage is important because it facilitates access and participation even when the platform itself does not offer experiential richness (Pedroso et al., 2023).

Despite the difference in ease of use, students perceived videoconferencing and metaverse venues as similarly useful for conducting school events. This non-significant difference suggests that usefulness judgments were largely driven by shared instrumental capabilities: both platforms enable remote attendance, communication, and structured event facilitation. Prior research supports this pattern across technologies. Videoconferencing has been consistently framed as useful for goal-oriented participation in online education (Pedroso et al., 2023), while metaverse environments have also been evaluated as beneficial for supporting educational activities and interaction through alternative digital affordances (Maghaydah et al., 2024). In other words, students may recognize that both technologies “work” as event delivery mechanisms even if they differ in how naturally or enjoyably the experience unfolds.

However, the metaverse demonstrated a significant advantage in social presence, reinforcing its value as a socially oriented venue rather than purely a functional one. Unlike videoconferencing, which often confines interaction to a screen-based interface and turn-taking conversation patterns, the metaverse supports avatar-based copresence and a sense of shared space, which can more closely mirror natural social dynamics. Although the effect size was modest, it suggests that the metaverse provides a practically meaningful improvement in students' perceived social connectedness while maintaining comparable levels of perceived usefulness. This finding aligns with Barreda-Ángeles et al. (2023), who emphasized that social VR platforms can strengthen social presence and make communication feel more natural. The result also complements the broader findings in this study that metaverse events were rated more engaging than videoconferencing, suggesting that the same immersive features that increase social presence may also sustain attention and involvement. It is likewise important to clarify that

the present study does not analyze interactional discourse directly. The evidence pertains to students' perceptions of communicative connection, copresence, and social engagement rather than to observed communication practices such as turn design, repair, participation structure, or other discourse patterns. Accordingly, the social presence findings should be interpreted as indicators of perceived interactional quality. Overall, this supports the argument that while videoconferencing may be the more accessible platform due to usability, metaverse environments may be better suited for school events where communal energy, informal interaction, and "being there together" are core experiential goals as perceived by participants.

Post-Event Preferences and Willingness to Attend Future Events

Students' post-event evaluations provide strong converging evidence that event venue experiences translate into meaningful differences in future participation intentions. Across indicators, students in the physical and metaverse settings expressed stronger endorsement than those in the videoconferencing setting. Most students tended to prefer the venue they experienced. However, preference endorsement was notably weaker in videoconferencing compared to the other formats. Students were substantially more likely to express willingness to attend future events when the format was physical or metaverse rather than videoconferencing. These findings suggest that students do not treat all online formats as equivalent substitutes for school celebrations but instead distinguish between platforms based on experiential quality and the extent to which the event feels socially and emotionally fulfilling.

A particularly important pattern is that even students assigned to videoconferencing reported greater willingness to attend future physical and metaverse events than videoconferencing events. This indicates that limited endorsement for videoconferencing is not merely explained by unfamiliarity or resistance to online participation. Rather, students appear to evaluate formats based on their perceived ability to deliver an event-like experience. Although videoconferencing may offer logistical convenience and ease of use, its restricted interactivity and limited atmosphere likely reduce its appeal as a celebration venue. This interpretation is consistent with earlier findings showing that videoconferencing environments were perceived as lower in event value, environmental support, and satisfaction, which may subsequently weaken students' preferences and reduce future participation intentions.

Importantly, metaverse formats emerged as a promising alternative. Students exposed to metaverse events demonstrated high levels of preference endorsement and future willingness, approaching outcomes observed in the physical setting and surpassing videoconferencing outcomes. This suggests that immersive virtual environments may offer an experiential middle ground by maintaining the accessibility of online participation while restoring features commonly associated with face-to-face celebrations, such as richer interaction, spatial presence, and a stronger sense of shared occasion. This contributes to discussions on event delivery formats, as hybrid event models are often recommended (e.g., Balestri et al., 2022), yet the metaverse is rarely positioned as a viable standalone venue. Overall, these findings strengthen the implication

that when physical events are not feasible, metaverse environments may provide a more sustainable and socially acceptable alternative than videoconferencing for school celebrations.

Implications for Practice, Pedagogy, and Policy

These findings offer several implications for institutional practice in designing and delivering school events during periods of disruption. Given that videoconferencing was consistently associated with weaker perceived value, environmental support, and satisfaction, institutions should treat it as an access-preserving venue rather than an experience-preserving format. In contrast, metaverse events yielded stronger engagement and higher perceived value relative to videoconferencing while approximating several experiential qualities of physical events. These findings suggest that immersive platforms may serve as a suitable alternative under comparable institutional conditions. At the same time, implementation should be viewed as context dependent. Institutions with limited technological infrastructure may require phased adoption, additional technical support, and strategic investment before realizing similar benefits. From a managerial standpoint, this supports the strategic development of metaverse-ready capabilities (e.g., facilitator training, technical moderation protocols, and infrastructure investments) to ensure that virtual events remain socially interactive, well-supported, and emotionally meaningful rather than reduced to linear attendance.

From a pedagogical perspective, the advantages observed in metaverse engagement and social presence indicate that immersive environments may be leveraged not only for celebrations but also for experiential learning purposes. Educators may embed metaverse-based activities into curricular and co-curricular experiences through interactive simulations, exhibit-style learning events, student showcases, workshops, and role-play scenarios that require collaboration and exploration. Because these environments support embodied participation, spatial interaction, and copresence, they can foster active learning processes that are often difficult to sustain in videoconferencing formats, particularly when students are expected to engage in discovery-oriented, practice-based, or socially constructed learning. These insights align with the broader argument that immersive environments are effective when learning is designed around participation and experience rather than passive consumption of content (Onu et al., 2024).

At the policy level, the results highlight the need for institutional guidelines that move beyond simply enabling online events toward supporting quality standards for immersive virtual engagement. The pattern of post-event preferences and willingness suggests that students do not treat all online formats as equivalent substitutes; rather, future participation intentions are shaped by whether the venue can deliver event-like experiences that feel socially and emotionally fulfilling. Institutions may therefore consider incorporating immersive platforms into continuity planning policies, with provisions for staff development, accessibility supports, privacy and safety safeguards, and minimum experience standards (e.g., facilitation design, student support mechanisms, interaction scaffolds). Such policy support can legitimize immersive virtual events not merely as emergency substitutes but as sustainable institutional options for preserving community life and student belonging when physical gatherings are constrained.

Study Limitations and Future Research

Several limitations of the study point to productive directions for future research. First, its comparison between current virtual event experiences and students' prior in-person experiences relies on retrospective evaluation. Although this design was useful for establishing a familiar experiential benchmark, it captures remembered rather than concurrently observed physical-event experience. This limitation should be emphasized because retrospective ratings may be shaped by memory effects, nostalgia bias, and selective recall, particularly when students compare a current event experience with prior school events that may have differed in timing, scale, facilitation, or emotional salience. The pre-post comparisons should be interpreted as comparative self-reports against a recalled baseline rather than as evidence equivalent to a fully matched, concurrently observed physical-event condition. Future studies could extend this work through repeated-measures, crossover, or switching-replications designs in which the same participants experience multiple venue formats under more closely matched conditions.

Second, the present study focuses on perceived interactional quality rather than interactional behavior itself. Measures such as social presence, engagement, and sense of community provide important insight into how students experience different venues, but they do not reveal how communication actually unfolds within those environments. Future research could therefore incorporate interactional data, such as chat logs, audio transcripts, screen recordings, movement traces, or observational coding, to examine how turn-taking, peer-group formation, conversational flow, and proximity-based participation differ across physical, videoconferencing, and metaverse settings. This would help clarify which specific communicative mechanisms account for the experiential advantages observed in more immersive environments.

Third, the study was conducted within a single institutional context using students from computing-related programs, with a predominantly male sample. This context is analytically useful because it provides insight into event participation in a setting with relatively high exposure to digital systems, but it also raises the question of whether the observed advantages of immersive venues depend partly on participants' disciplinary background, technological familiarity, or demographic composition. In addition, the institution's established metaverse infrastructure may not reflect the technological readiness of many schools. As such, the transferability of the findings should be considered with caution, particularly in institutions where immersive platforms, technical support, or digital resources are still limited. Future studies should therefore move beyond simple replication by examining how venue effects vary across institutional types, academic disciplines, and gender compositions, as well as across student populations with different levels of prior experience with immersive platforms. Such work would help determine whether metaverse-based events function as a broadly applicable alternative venue or whether their effectiveness is strongest under particular social and technological conditions.

Fourth, another interpretive limitation concerns the possibility that the observed advantages of the metaverse were shaped not only by venue affordances themselves but also by related contextual factors. Because metaverse-based school events were relatively uncommon for

this sample, novelty effects may have contributed to stronger engagement or preference ratings. This possibility is vital when interpreting the higher engagement reported in the metaverse condition, since students' responses may partly reflect the excitement of encountering a relatively new event format rather than a stable engagement advantage of the venue itself. Although facilitation was designed to be consistent in overall structure and intent across conditions, participants may still have experienced venue-specific differences in guidance, support, or event pacing. Technical familiarity may also have influenced outcomes in both directions: videoconferencing may have benefited from routine student familiarity, while the metaverse may have simultaneously generated heightened interest for some participants and usability barriers for others. Future research should therefore examine these factors more directly by controlling for prior platform familiarity, systematically varying facilitation strategies, and distinguishing novelty-driven responses from more stable evaluations of immersive event participation. Longitudinal or repeated-exposure designs would be particularly useful for determining whether metaverse engagement remains high after students become more accustomed to the platform.

Finally, the quasi-experimental, section-based implementation was appropriate for a real institutional event, but it also suggests an important next step for future research: identifying which elements of venue design drive the observed differences. In the present study, each condition necessarily bundled multiple features together, including modality, interface structure, movement possibilities, facilitation style, and the potential novelty of the environment. Future research could use more fine-grained experimental manipulation to isolate specific affordances, such as avatar embodiment, spatial navigation, breakout structure, moderation intensity, or prior familiarity with the platform, in order to determine which features most strongly influence engagement, social presence, environmental support, and future participation intentions.

CONCLUSION

Metaverse-based school events show promise as an alternative venue when in-person gatherings are disrupted by disasters, health emergencies, or institutional constraints, particularly for celebrations that depend on shared atmosphere, spontaneous interaction, and communal energy. While videoconferencing remains a practical access-enabling option because of its familiarity and ease of use, the findings suggest that it functions as an experientially constrained format for school events. Students perceived lower value, weaker environmental support, and lower satisfaction than in physical events. In contrast, metaverse events appeared to more closely approximate several core experiential qualities of physical celebrations by enabling socially situated and embodied participation through avatar-mediated copresence and activity-based engagement. Consistent with the study's theoretical framing, physical venues continued to provide the strongest support structures. At the same time, immersive environments were associated with richer perceived interactional experiences and higher engagement. In this study, engagement in the metaverse approached and, on some measures, exceeded students' recalled physical event experiences. These differences were consequential because students showed stronger post-event preference endorsement and greater willingness to attend future events in

physical and metaverse formats than in videoconferencing settings. Overall, the results suggest that institutions should consider that different virtual venues may provide different student experiences and therefore align event objectives with the affordances of the selected delivery environment. When community, interaction, and shared experience are central objectives, metaverse platforms may represent one promising option among emerging virtual event venues.

REFERENCES

- Balestri, M., Campera, M., Beaman, E., Bell, D., Pink, R., & Nekar, K. A. I. (2022). Let's Get Virtual! Reinventing a Science Festival During a Pandemic: Limitations and Insights. *International Journal of Science Education, Part B*, 12(3), 193-202. <https://doi.org/10.1080/21548455.2022.2058106>
- Barreda-Ángeles, M., Horneber, S., & Hartmann, T. (2023). Easily Applicable Social Virtual Reality and Social Presence in Online Higher Education During the COVID-19 Pandemic: A Qualitative Study. *Computers & Education: X Reality*, 2, 1-13. <https://doi.org/10.1016/j.cexr.2023.100024>
- Bietz, M. J., Goyal, N., Immorlica, N., MacIntyre, B., Monroy-Hernández, A., Pierce, B. C., ... Wohn, D. Y. (2022). Social Presence in Virtual Event Spaces. *Extended Abstracts of the 2022 CHI Conference on Human Factors in Computing Systems*. <https://doi.org/10.1145/3491101.3503713>
- Bronfenbrenner, U. (1992). Ecological Systems Theory. In *Six theories of child development: Revised formulations and current issues*. (pp. 187-249). Jessica Kingsley Publishers. <https://psycnet.apa.org/record/1992-98662-005>
- Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319-340. <https://doi.org/10.2307/249008>
- Di Natale, A. F., Repetto, C., & Villani, D. (2024). Desktop-Based Virtual Reality Social Platforms Versus Video Conferencing Platforms for Online Synchronous Learning in Higher Education: An Experimental Study to Evaluate Students' Learning Gains and User Experience. *Journal of Computer Assisted Learning*. <https://doi.org/10.1111/jcal.13075>
- El Zaatari, W., & Maalouf, I. (2022). How the Bronfenbrenner Bio-ecological System Theory Explains the Development of Students' Sense of Belonging to School? *Sage Open*, 12(4), 1-18. <https://doi.org/10.1177/21582440221134089>
- Garcia, M. (2026). Virtual Selves and Embodied Learning: Enacting Simulated Lived Experience in the Metaverse as Critical Pedagogy in Higher Education. *Higher Education Research & Development*, 45(2), 448-468. <https://doi.org/10.1080/07294360.2026.2617307>
- Garcia, M. B. (2025). Metaverse Experience and Technology Acceptance (META): A Framework for Decoding Digital Existence in Virtual Worlds. *Education and Information Technologies*. <https://doi.org/10.1007/s10639-025-13860-7>
- Garcia, M. B., Adao, R. T., Pempña, E. B., Quejado, C. K., & Maranan, C. R. B. (2023a). MILES Virtual World: A Three-Dimensional Avatar-Driven Metaverse-Inspired Digital School Environment for FEU Group of Schools. *Proceedings of the 7th International Conference on Education and Multimedia Technology*. <https://doi.org/10.1145/3625704.3625729>
- Garcia, M. B., Nadelson, L. S., & Yeh, A. (2023b). "We're going on a virtual trip!": A Switching-Replications Experiment of 360-Degree Videos as a Physical Field Trip Alternative in Primary Education. *International Journal of Child Care and Education Policy*, 17(4), 1-16. <https://doi.org/10.1186/s40723-023-00110-x>
- Garcia, M. B., Quejado, C. K., Maranan, C. R. B., Ualat, O. N., & Adao, R. T. (2024). Valentine's Day in the Metaverse: Examining School Event Celebrations in Virtual Worlds Using an Appreciative Inquiry Approach. *Proceedings of the 8th International Conference on Education and Multimedia Technology*. <https://doi.org/10.1145/3678726.3678739>
- Guo, X., & Lee, J. S. (2023). A Systematic Review of Informal Digital Learning of English: An Ecological Systems Theory Perspective. *System*, 117, 1-14. <https://doi.org/10.1016/j.system.2023.103097>
- Hayes, N., O'Toole, L., & Halpenny, A. M. (2017). *Introducing Bronfenbrenner: A Guide for Practitioners and Students in Early Years Education*. Routledge. <https://doi.org/10.4324/9781315646206>
- Jo, H., & Shin, S.-A. (2024). Investigating Viewer Engagement in Esports Through Motivation and Attitudes Toward Metaverse and NFTs. *Scientific Reports*, 14(1), 1-14. <https://doi.org/10.1038/s41598-024-70847-z>

- Lee, H.-W., Chang, K., Uhm, J.-P., & Owiro, E. (2023). How Avatar Identification Affects Enjoyment in the Metaverse: The Roles of Avatar Customization and Social Engagement. *Cyberpsychology, Behavior, and Social Networking*, 26(4), 255-262. <https://doi.org/10.1089/cyber.2022.0257>
- Liu, D., & Tan, X. (2019). Incorporating Social Events into School Curriculum: How It Relates to Student Growth. *Educational Planning*, 26(1), 43-50. <https://files.eric.ed.gov/fulltext/EJ1212485.pdf>
- Maghaydah, S., Al-Emran, M., Maheshwari, P., & Al-Sharafi, M. A. (2024). Factors Affecting Metaverse Adoption in Education: A Systematic Review, Adoption Framework, and Future Research Agenda. *Heliyon*, 10(7), 1-17. <https://doi.org/10.1016/j.heliyon.2024.e28602>
- Martí-Testón, A., Muñoz, A., Gracia, L., & Solanes, J. E. (2023). Using WebXR Metaverse Platforms to Create Touristic Services and Cultural Promotion. *Applied Sciences*, 13(14), 1-20. <https://doi.org/10.3390/app13148544>
- Mennecke, B. E., Triplett, J. L., Hassall, L. M., & Conde, Z. J. (2010). Embodied Social Presence Theory. 2010 43rd Hawaii International Conference on System Sciences. <https://doi.org/10.1109/HICSS.2010.179>
- O'Donnell, A. W., Redmond, G., Gardner, A. A., Wang, J. J. J., & Mooney, A. (2024). Extracurricular Activity Participation, School Belonging, and Depressed Mood: A Test of the Compensation Hypothesis During Adolescence. *Applied Developmental Science*, 28(4), 596-611. <https://doi.org/10.1080/10888691.2023.2260745>
- Oh, H. J., Kim, J., Chang, J. J. C., Park, N., & Lee, S. (2023). Social Benefits of Living in the Metaverse: The Relationships Among Social Presence, Supportive Interaction, Social Self-Efficacy, and Feelings of Loneliness. *Computers in Human Behavior*, 139, 1-11. <https://doi.org/10.1016/j.chb.2022.107498>
- Onu, P., Pradhan, A., & Mbohwa, C. (2024). Potential to Use Metaverse for Future Teaching and Learning. *Education and Information Technologies*, 29(7), 8893-8924. <https://doi.org/10.1007/s10639-023-12167-9>
- Pedroso, J. E. P., Oducado, R. M. F., Ocampo, A. R. S., Tan, V. S., & Tamdang, K. A. (2023). Factors Influencing Intention to Use Videoconferencing Tools in Online Distance Education Among Students in Philippine Maritime Schools. *Australian Journal of Maritime & Ocean Affairs*, 15(2), 142-153. <https://doi.org/10.1080/18366503.2021.2014181>
- Piccio, B., Helgason, I., Elsdén, C., & Terras, M. (2022). A Hefty Dose of Lemons: The Importance of Rituals for Audiences and Performers at the Online Edinburgh Festival Fringe 2020. *International Journal of Performance Arts and Digital Media*, 18(1), 154-175. <https://doi.org/10.1080/14794713.2022.2036489>
- Pradana, M., & Elisa, H. P. (2023). Metaverse in Education: A Systematic Literature Review. *Cogent Social Sciences*, 9(2), 1-24. <https://doi.org/10.1080/23311886.2023.2252656>
- Rzeszewski, M., Osborne, T., Jones, P., Evans, L., & Weitkamp, G. (2024). Interviewing in the Metaverse: The Renewed Importance of Location and Embodiment. *Applied Geography*, 167, 1-9. <https://doi.org/10.1016/j.apgeog.2024.103295>
- Seow, P.-S., & Pan, G. (2014). A Literature Review of the Impact of Extracurricular Activities Participation on Students' Academic Performance. *Journal of Education for Business*, 89(7), 361-366. <https://doi.org/10.1080/08832323.2014.912195>
- Standaert, W., Muylle, S., & Basu, A. (2021). How Shall We Meet? Understanding the Importance of Meeting Mode Capabilities for Different Meeting Objectives. *Information & Management*, 58(1), 1-14. <https://doi.org/10.1016/j.im.2020.103393>
- Ton, H. N. N., & Do, Q. H. X. (2022). The Effectiveness of Virtual Events During COVID-19 Pandemics. *Advances in Social Sciences Research Journal*, 9(7), 278-295. <https://doi.org/10.14738/assrj.97.12655>
- Vandenberg, F., & Berghman, M. (2024). The Show Must Go On(line): Livestreamed Concerts and the Hyper-Ritualisation of Genre Conventions. *Poetics*, 103, 1-13. <https://doi.org/10.1016/j.poetic.2023.101782>
- Yung, R., Le, T. H., Moyle, B., & Arcodia, C. (2022). Towards a Typology of Virtual Events. *Tourism Management*, 92, 1-8. <https://doi.org/10.1016/j.tourman.2022.104560>
- Zhang, G., Cao, J., Liu, D., & Qi, J. (2022). Popularity of the Metaverse: Embodied Social Presence Theory Perspective. *Frontiers in Psychology*, 13, 1-13. <https://doi.org/10.3389/fpsyg.2022.997751>

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LET'S COLLABORATE!

If you are looking for research collaborators, please do not hesitate to contact me at mbgarcia@feutech.edu.ph.



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